

**We Claim:**

1. A model of macrostructural properties of a bone, wherein said model comprises hierarchical structural and hierarchical mechanical properties of microstructure of said bone and interactions of said bone with external force.
2. A model as defined in claim 1, wherein said bone is compact bone or cancellous bone.
3. A model as defined in claim 1, wherein said mechanical properties are selected from the group consisting of tension, compression, shear, bending, torsion, prestress, pinching, and cement line slippage.
4. A method of predicting deformation and fractures of bone using the model as defined in claim 1.
5. A method of identifying the requirements of bone reconstruction and prosthesis using the model as defined in claim 1.